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ABSTRACT

The purposes of the study were to: (1) determine some major characteristics of Marion County soybean producers and their farms; (2) more accurately determine which recommended production practices soybean producers were using in 1968 and 1969; (3) study the relation between use of recommended production practices and yield levels; and (4) identify some of the more important factors influencing adoption of recommended soybean production practices. Thirty-eight soybean producers were interviewed to gather data, and growers were categorized in above- and below-average yield levels for comparison purposes. Findings, conclusions, and recommendations are given. (Author/DB)

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A Research Summary
of a
Graduate Study

MANAGEMENT PRACTICES OF SOYBEAN PRODUCERS IN MARION COUNTY, TENNESSEE

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and
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MANAGEMENT PRACTICES OF SOYBEAN PRODUCERS IN

MARION COUNTY, TENNESSEE

by

William A. Hall

March 1971

ABSTRACT

The purposes of the 1971 study were to: (1) determine some major characteristics of Marion County soybean producers and their farms; (2) more accurately determine which recommended production practices soybean producers were using in 1968 and 1969; (3) study the relation between use of recommended production practices and yield levels; and (4) identify some of the more important factors influencing adoption of recommended soybean production practices. Thirty-eight soybean producers, which constituted both population and sample, were interviewed for the purpose of gathering data for study purposes. The data included the crop years of 1968 and 1969. Growers were categorized in above and below average yield levels, and main comparisons were made between these two groups.

Findings disclosed that soybean producers and their farms had the following characteristics: (1) had an average farm size of 430 acres; (2) had an average of 155 acres of cropland; (3) planted an average of 102 acres of soybeans; (4) had an average educational

level of 9.5 grades; (5) had an average age of 47.1 years; and (6) had a median gross family income of $14,375 (for those answering this optional question).

When the High and Low yield groups were compared it was found that the former had: (1) a larger average farm size (498 vs 365 acres); (2) more average acres of cropland (178 vs 150 acres); (3) planted fewer acres of soybeans (92 vs 114 acres); (4) a slightly higher average educational level (9.9 vs 9.2 grades); (5) a slightly lower average age (46.8 vs 47.9 years); and (6) a higher median gross family income for those answering this optional question ($17,499 vs $13,333).

With regard to adoption of eleven recommended soybean production practices studied, farmers in the High yield group had slightly higher total average practice diffusion ratings than did the Low yield group. Essentially no difference was shown between the High and Low yield groups with regard to use of soybean production practices and the producer's position in the diffusion process, although more of the former were liming and fertilizing according to soil test recommendations and were seeking advice from professionals.

Some reasons given to explain why soybean producers were not adopting recommended soybean production practices included: (1) lack of adequate machinery and equipment; (2) lack of technical knowledge needed; (3) belief that the relative cost of the practice was high and that net returns per acre were not appreciably improved; (4) more rewarding activities demanded grower's time and money; and (5) belief that practices were not sound.

With regard to sources of advice about soybean production practices, the growers listed (in order of frequency mentioned): neighbors and friends; seed, fertilizer, or pesticide dealers; soybean buyers; equipment dealers; Extension agents; Soil Conservation Service representative; soybean specialist; Farmers Home Administration representative; and banker or Production Credit Association representative. Additional sources of information mentioned were farm magazines, Extension distributed bulletins and publications, Extension newsletters, radio, weekly newspapers, farm meetings, commercial bulletins, daily newspapers, field days and tours, and television in that order.

It was recommended that study findings be used in the development of an Extension teaching plan for soybean producers in Marion and similar counties.

RESEARCH SUMMARY*

I. INTRODUCTION

Prior to this 1971 study, complete information was not available on yield levels of Marion County soybean porducers. Also, reliable information was not available concerning the use of recommended soybean production practices. It was felt that information was needed and could be utilized by the Tennessee Agricultural Extension Service staff in the formulation of long time and annual plans of work.

Purpose

The general puspose of this study was to gather pertinent data that would enable the Extension staff to formulate plans of work and teaching schedules based on the most accurate and latest information concerning soybean production in the county.

Research Methodology

A special interview schedule was developed with the aid of the specialist staff and used to collect data concerning certain characteristics of soybean producers and their farms, production practices being used, relation of use of recommended production practices and yield levels, and some of the more important factors influencing the

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adoption of recommended soybean production practices.

A complete list of soybean producers was obtained from the two firms that buy soybeans from Marion County growers. Since the list included only 38 producers, it was decided to interview all growers.

Upon completion of the survey it was found that in 1968, 38 producers harvested soybeans from 3,879 acres, with an average yield of 20.9 bushels per acre. In 1969, 38 producers harvested soybeans from 3,926 acres, with an average yield of 25.7 bushels per acre. A two-year average yield for each grower was computed. Producers were divided into High and Low yield groups for study purposes. Those in the High yield group averaged more than 23.3 bushels per acre, while those in Low yield group had averages below 23.3 bushels. The range for the High yield group was 24 through 35 bushels per acre, and for the Low yield group the range was from 13 through 23 bushels.

Analyses were done, for the most part, in simple numbers and percents. Practice diffusion ratings and averages were computed for each individual and production groups. Chi square values were calculated to determine significance of relationships where applicable. The .05 level of confidence was selected for testing.

II. MAJOR FINDINGS

Characteristics of Soybean Producers

A number of summary statements may be made concerning the findings related to selected characteristics of the soybean producers in Marion County.

Survey data did not show a significant relation between major occupation of soybean producers and yield. Fifty-eight percent of the 38 producers were full-time farmers, and the remaining 42 percent were part-time farmers.

Forty-one percent of the High yield group said that soybeans was their major source of income, as compared to only 29 percent of the Low yield group. However, the relation between soybeans as a major source of income and yield was not significant.

In studying the relation of other major sources of income and yield, it was found that 33 percent of the Low yield group listed swine as their major source of income, as compared to only 6 percent of the High yield producers. Eighteen percent of the High yield group indicated dairy as their major source of income, while only 5 percent of the Low yield group did so. The relation was not significant at the level selected for testing, though it did achieve the .30 level of confidence.

Sixty-one percent of the soybean producers had completed grades 10 - 13. Thirty-four percent had completed grades 1 - 9, and 5 percent had an education beyond the high school level. The average educational level for all producers was 9.5 grades. The High yield group educational average was 9.9 grades, as compared to 9.2 grades for the Low yield producers. No significant relation between educational level and yield was shown.

Fifty-eight percent of all soybean producers were 45 years of age or older. The average age was 47.1 years. The Low yield group had a slightly higher average age (47.9) than did the High yield group (46.8). However, the relation was not significant at the level selected for testing.

The median gross family income for the 79 percent answering this optional question was $14,375. The 76 percent of the High yield group answering had a higher median gross family income ($17,499) than did the 81 percent of the Low yield group answering ($13,333). The relation was not significant, however.

No relation between "attitude" of the producers toward the survey and yield was shown; though all were at least "somewhat friendly." The same was true concerning "interest" shown by the producers in improvement in their soybean production and yield, though 8 percent of the producers were "indifferent."

Ninety-five percent of the Low yield group were considered to be "sooner than average," or earlier, on the practice adoption scale. Only 80 percent of the High yield producers were considered to be this early. Though not significant at the level selected for testing, the relation did achieve the .20 level of confidence.

Fifty-three percent of the soybean producers were known "very well" by the interviewer, and only 5 percent were known "not at all." However, no significant relationship between the degree to which producers were known and yield was shown to exist, even though 65 percent of the High yield group were known "very well," as compared to only 43 percent of the Low producers.

Characteristics of the Farms

In general the High yield group had larger farms by an average of 133 acres, more cropland by an average of 28 acres, and grew smaller acreages of soybeans by 22 acres than did the Low yield group. However, in no case was the Chi square value significant at the level selected for testing.

Seventy-four percent of all soybean producers reported to have fertilized and limed their fields according to soil test recommendations. However, most farmers indicated that they tested their soils only every three or four years. Forty-four percent of all producers said the p^H level of their soils was below 6.0. A higher percent of the High yield group (29) indicated the p^H level of their soils was above 6.0 than was true for the Low yield group (19 percent). The Chi square analyses did not reveal significant relationships between either soil testing or p^H levels and yield.

Eighty-nine percent of all producers planted soybeans in fields preceded by either soybeans or corn. Ninety-five percent of the Low yield producers followed this plan, as compared to 81 percent of the High yield group. The relation of the nature of the preceding crop and average yield, however, was not a significant one.

In regard to texture of soybean land, 67 percent of the Low yield group used land of "loamy" texture, as compared to 53 percent for the High yield group. The Chi square value was not significant; although it did attain the .20 level of confidence. It was unclear

what the low level relation might be, when considering all types of soil used by soybean producers. A more careful study of this variable might have explained differences.

All of the High yield producers marketed at least "some soybeans at Jasper," most of them marketing at "Jasper only," 14 percent of the Low yield group marketed at "Chattanooga only." Here again, the .20 level of significance, though not the required .05 probability.

No significance was indicated between size of planter or type of combine used and yield. This also was true regarding relations between general climatic conditions for the years of 1968 and 1969 and yield.

Soybean Production Practices

The farmers in the High yield group had a slightly higher average practice diffusion rating (4.48 out of 5.00) than did the Low yield group (4.37 out of a possible 5.00).

Eighty-five percent of the 38 soybean producers were, on the average in the "using stage" with regard to the 11 recommended production practices included in the interview schedule. No difference was noted when High and Low yield groups were compared.

Surprisingly large percents of both yield groups (41 percent for the High and 48 percent for the Low) had practice diffusion ratings in the "tried" stage (3.50 - 4.49) on the practices studied, but were no longer using them.

In regard to recommended practices, the only one that achieved the level ($P < .05$) of probability selected for testing was the number of plants per foot of row at harvest. Eighty-two percent of the High

yield group had 10 to 18 plants per foot of row at harvest, as compared to only 48 percent of the Low yield group. This finding did not agree with previous experiment station research, which in general, had shown no significant relation between plant population and yield of soybeans. Studies of "border effect," however had been promising.

Eighty-two percent of the High yield producers bought seed from a dealer, as compared to only 67 percent of the Low yield group. Nineteen percent of the Low yield group saved their own seed, while none of the High yield producers did so. The Chi square value achieved the .10 level of confidence, indicating some relation between yield produced and the source of seed even though the required .05 level of significance was not reached.

In regard to the relation between width of row and pounds of seed planted per acre and soybean yield, the required .05 level was not attained, though the .20 level was. Fifty-three percent of the High yield group used a 38-inch row width, while 61 percent of the Low yield group used row widths of 36-inches or less. Sixty-five percent of the High yield producers planted from 42 to 51 pounds of seed per acre, while only 43 percent of the Low yield group planted at this recommended rate.

Use of pre-emergence herbicides, inoculation of soybean seed, and length of time between emergence of soybeans and start of cultivation were not significantly related to yield of soybeans. The Chi square value for these practices did reach the .30 level of confidence, however. Slightly higher percents of the High yield group had used pre-emergence herbicides, inoculated seed, and started

cultivation within seven days after soybeans emerged than was true for the Low.

Fertilizer usage data showed no significant relationship between amount and analyses of fertilizer used, or lack of use of any fertilizer, and yield. Forty-five percent of all producers used between 6 and 86 pounds of nitrogen (N), which is not recommended for soybeans. Fifty-two percent of the Low yield group had used nitrogen fertilizer, as compared to only 36 percent of the High yield group, with higher percents of both yield groups using from 6 to 12 pounds of nitrogen. The Chi square value was not significant at the level selected for testing.

Fifty-five percent of all producers had used from 12 to 80 pounds of phosphate (P_2O_5) per acre. Sixty-two percent of the Low yield producers had used from 12 to 80 pounds of phosphate per acre, as compared to only 48 percent of the High yield group. Also, 52 percent of the High yield producers did not use any phosphate, as compared to only 38 percent of the Low yield group. A general recommendation when soil test results are not available would be to use from 20 to 40 pounds of phosphate per acre. The Chi square value was not significant, though the .20 level was attained.

Sixty percent of all producers used from 12 to 120 pounds of potash (K_2O) per acre. Sixty-seven percent of the Low yield group had used from 12 to 80 pounds of potash per acre. Forty-eight percent of the High yield producers had used this amount of potash, and 5 percent had used 120 pounds of potash. Forty-seven percent of the High

yield producers had used no potash, as compared to 33 percent of the Low yield group. Though not significant at the .05 level selected for testing, the relation between use of potash and yields did achieve the .30 level of confidence. A general recommendation when soil test results are not available would be to use from 20 to 40 pounds of potash per acre.

It should be noted that all the data concerning fertilizer usage includes 23 percent of the High and 19 percent of Low yield groups who had "heavily fertilized" the preceding crop.

All other recommended production practices when tested for relation to yield were found to be insignificant. Thus, little or no apparent relation existed between these practices and yields of soybeans. These practices included: number of weeks prior to planting that the seedbed was prepared, use of certified seed, use of registered seed, selection of varieties (all producers planted recommended varieties), number of seeds planted per foot or row, depth of planting (all producers planted at recommended depths depending on soil and moisture conditions), use of soil testing, testing soils within three years, use of Molybdenum when p^H was below 6.0, use of lime when p^H was below 6.0, effective control of weeds (e.g., cultivate and/or use of herbicides), effective control of insects and harvesting at correct moisture levels.

Factors Influencing Practice Adoption

Twenty-nine percent of the 38 producers said the one thing they "liked most" about soybean production was that it was "easy to grow and/or harvest." Twenty-six percent said soybeans was "good cash crop." Thirty-five percent of the High yield group indicated "easy to grow and/or harvest" as the thing they "liked most," while 29 percent of the Low yield producers said the one thing they "liked best" was that soybeans was a "good cash crop." Other reasons listed (in order of frequency listed by all producers) were, "low labor requirements and low overall production costs," "Low capital requirements," "good cash crop and good cash crop for farm rotation," "will stand dry and/or wet seasons" and "adaptable to land not suited for other crops."

Fifty percent of the soybean producers indicated that "weed control problems" was the one thing they "disliked most" about soybean production. Fifty-three percent of the High yield group mentioned "week control problems" as the one thing they "disliked most" about soybean production, while 47 percent of the Low yield group also did so. Other reasons listed were, in order of frequency, "low yields and low net income and/or prices," "price and profit vary too much and government control on prices," "improper moisture and foreign matter sampling for testing at the market," and "conflict in double cropping."

No relation was shown between things "liked" or "disliked" most about soybean production and yield.

Sixty-eight percent of all producers said they had "no plans for the future" concerning soybean production. Sixty-four percent of the High yield group indicated "no plans for the future," as compared to 72 percent of the Low yield group. Sixteen percent of the producers said they "planned to reduce" their acreage of soybeans, as did 12 percent of the High and 19 percent of the Low yield groups. The Chi square value was not significant.

Eighty-eight percent of the High yield group and 86 percent of the Low listed "neighbors and friends" most frequently as a source of advice concerning soybean production. "Seed, fertilizer, or pesticides dealers" ranked second as a source of advice for High yield producers. "Soybean buyers" were indicated as the second choice of advice for the Low yield group. "Equipment dealers" ranked fourth as a source of advice, and "Extension agents" ranked fifth for all yield groups. Other sources were (in order of frequency for all producers), "SCS representative," "soybean specialist," "FHA representative," and "banker or PCA representative."

All of the High yield group listed Experiment Station bulletins, Extension publications, and farm magazines as sources of information concerning soybean production. Ninety percent of the Low yield group listed farm magazines, and 86 percent listed bulletins and publications, and Extension newsletters as important sources of information.

other sources listed (in order of frequency mentioned by all producers) were, monthly or other newspapers, radio, weekly newspapers, farm meetings, commercial bulletins, daily newspapers, field days and tours, and television.

Forty percent of all producers listed "lack of adequate machinery and equipment" as the first most important reason why farmers in general do not adopt recommended production practices, while 35 percent of the High and 43 percent of the Low yield groups listed this reason first. Forty-one percent of the High and 5 percent of the Low yield producers listed "don't have technical knowledge needed" as the primary reason farmers do not adopt recommended practices. Twenty-four percent of the Low yield group listed "more rewarding activities claim owner's time and money" as the first most important reason for failing to adopt practices. The statistical analysis (Chi square value) of the reasons listed as the first most important reason farmers do not adopt recommended practices was significant at the .05 level selected for testing--establishing a relation with soybean yield.

"The cost of the practice outweighs the benefits" was listed most frequently by all producers, and both yield groups, as the second most important reason farmers in general do not adopt recommended production practices. In neither case was the Chi square value significant at the required ($P < .05$) of significance.

III. IMPLICATIONS

Based on the findings of this study, a few implications may be drawn. The relatively small number of significant relations found to have existed between the variables studied and soybean yields

tended to verify observations and findings of previous similar studies. Soybean production does not seem to be related to individual recommended production practices to the extent that practices have been found to be influential with other crops (e.g. corn, cotton, tobacco) grown commercially in Tennessee. However, the use of the total bundle of recommended production practices may be more critical for soybeans than for other crops. Further study in this area may be desirable.

The interest in and need for an educational program is implied by study findings since nearly all soybean producers were interested in such efforts and a large percent felt they lacked the technical knowledge needed to do an efficient production job.

It was surprising to note the degree to which Extension educational efforts had been reaching the soybean producers through news releases, radio, meetings, publications, newsletters and other media used. The influence of such media used. The influence of such media would suggest the advisability of their continued and accelerated use in any soybean educational program developed for Marion or similar counties.

Subject matter should include emphasis on liming and fertilization according to soil test recommendations. The study revealed that soybean growers were not basing their fertilizer usage on current soil test recommendations. In many cases more fertilizer was

being used than would be called for by soil test recommendations. Far too few farmers were found to be liming their soybean fields as actually needed.

Furthermore, continued research and educational efforts should be directed toward expanded use of herbicides, since almost two-thirds of the producers indicated they were not using such chemicals, even though one-half of the growers said weed control was their biggest problem in soybean production.

Further study would appear to be called for regarding row width and number of plants per foot of harvested row, since these items were found to have some influence on yields of soybeans.

Similar surveys of soybean producers in other soybean producing counties in Tennessee should be conducted to ascertain whether or not the findings of this study might apply more generally.

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APPENDIX

TABLE 1

AVERAGE SOYBEAN PRACTICE DIFFUSION RATINGS AND TOTAL AVERAGE RATINGS*
FOR ALL MARION COUNTY PRODUCERS, HIGH AND LOW YIELD GROUPS

Soybean Production Practices	Total Av. Rating	High Yield Av. Rating	Low Yield Av. Rating
1. Planted a soybean variety or varieties recommended last year.	5.00	5.00	5.00
2. Planted between May 1 and June 15 last year	4.89	5.00	4.81
3. Used inoculant on seed or grew soybeans in all fields at least one year in the last three years prior to the last.	4.32	4.24	4.38
4. Treated seed with Molybdenum where lime was not used or where p^H was below 6.0.	3.87	3.65	4.05
5. Used recommended seeding rate.	4.95	5.00	4.90
6. Prepared seedbed in advance of planting.	4.89	4.77	5.00
7. Fertilized (including liming) according to soil test recommendations.	3.50	3.76	3.29
8. Effectively controlled weeds last year by using recommended procedures.	4.74	4.94	4.57
9. Effectively controlled insects last year by using recommended procedures.	4.79	4.82	4.76
10. Harvested when moisture was between 10 and 15 percent.	4.21	4.18	4.24
11. Got the advice of professionals in the area of soybean production and marketing.	3.47	3.88	3.14
Total Average Rating	4.42	4.48	4.37

*Interpreting the average ratings listed, the following intervals apply - 0 (0.00-0.49) = unaware; 1 (0.50-1.59) = aware of the practice; 2(1.50-2.49)= interested in the practice; 3 (2.50-3.49) = planning to try the practice; 4 (3.50-4.49) = tried the practice but not now using it, and 5 (4.50-5.00) = using the practice.

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